

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. - 15. (canceled).

16. (currently amended): A leak detector for detecting leakage of liquid stored in a tank based on fluctuation in a level of the liquid, the tank including a top plate, a bottom plate, and a side plate connecting the top plate and the bottom plate, the leak detector comprising:

a flow-rate measuring portion, provided near a bottom end of the leak detector, for measuring a flow rate between liquid in the tank and liquid retained within the leak detector;

a bottom attaching portion provided at the bottom end of the leak detector to detachably attach the bottom end to the bottom plate; and

a top assembly, attached to the top plate so as to cover ~~and~~an opening provided in the top plate and having a through opening through which an upper end of the leak detector is supported in such a manner that the upper end of the leak detector is simultaneously movable relatively to the top plate in a direction substantially perpendicular to a surface of the liquid while the bottom end of the leak detector is detachably attached to the bottom plate.

17. (previously presented): The leak detector according to claim 16, comprising:

a liquid inlet/outlet portion near the bottom end through which the liquid flows in and out of the leak detector;

a flow-rate measuring unit arranged near the liquid inlet/outlet portion inside the leak detector toward the upper end, and configured to measure an amount of flow of the liquid occurring through the liquid inlet/outlet portion; and

a liquid retaining portion arranged between the upper end and the flow-rate measuring unit, and including a space configured to retain liquid that has flown therein through the liquid inlet/outlet portion.

18. (previously presented): The leak detector according to claim 17, wherein the bottom end is detachably attached to the bottom plate with a magnet.

19. (previously presented): The leak detector according to claim 16, wherein the upper end is supported in the through opening using an elastic member.

20. (previously presented): The leak detector according to claim 17, further comprising a protective member configured to protect the flow-rate measuring unit and the liquid retaining portion from the liquid, and arranged outside the flow-rate measuring unit and the liquid retaining portion, wherein

the protective member is formed with a metal having such a thermal expansion coefficient that a distance between the flow-rate measuring unit and the bottom plate is maintained substantially invariant.

21. (previously presented): The leak detector according to claim 20, wherein

the protective member is formed with a material identical to a material of the tank.

22. (previously presented): The leak detector according to claim 16, further comprising an intermediate member formed with a magnetic material, and arranged at the bottom end such that the leak detector is attached to the bottom plate through the intermediate member.

23. (currently amended): The leak detector according to claim 17, wherein the flow-rate measuring unit includes

a flow path ~~portion-capillary~~ through which liquid flows between the space and the liquid inlet/outlet portion;

at least one temperature detecting unit configured to detect temperature of liquid inside the flow path;

a heating unit configured to heat the liquid inside the flow path ~~portion-capillary~~;
and

a controlling unit configured to control heating temperature of the heating unit for heating the liquid inside the flow path ~~portion-capillary~~ so that the temperature of liquid inside the liquid retaining portion and the temperature of the liquid inside the flow path ~~portion-capillary~~ become substantially equal.

24. (currently amended): A leak detector for detecting leakage of liquid stored in a tank based on fluctuation in a level of the liquid, the leak detector comprising:

a liquid retaining portion including a space configured to retain liquid flown into the leak detector, the liquid flown being a part of the liquid in the tank;

~~a flow path portion through which the space communicates with an interior of the tank and through which the liquid flows in and out;~~

~~a flow path opening/closing unit configured to open and close at least one end of the flow path portion to control the flow of the liquid into the flow path portion;~~

a flow-rate measuring unit including:

a flow path capillary through which the space communicates with an interior of the tank and through which the liquid flows in and out, wherein the flow rate measuring unit is configured to measure an amount of the liquid flowing inside the flow path capillary portion;
and

a flow path opening/closing unit configured to open and close at least one end of the flow path capillary to control the flow of the liquid into the flow path capillary; wherein said flow path opening/closing unit is located ~~near said flow-rate measuring unit~~ at the at least one end of said flow path capillary; and

a calibrating unit configured to calibrate the flow-rate measuring unit under a closing operation of the flow path opening/closing unit.

25. (currently amended): A leak detector for detecting leakage of liquid stored in a tank based on fluctuation in a level of the liquid, the leak detector comprising:

a liquid retaining portion including a space configured to retain liquid flown into the leak detector, the liquid flown being a part of the liquid in the tank;

~~a flow path portion through which the space communicates with an interior of the tank and through which the liquid flows in and out;~~

~~a flow path opening/closing unit configured to open and close at least one end of the flow path portion;~~

a flow-rate measuring unit provided with a flow path capillary through which the space communicates with an interior of the tank and through which the liquid flows in and out and configured to measure an amount of the liquid flowing inside the flow path ~~portion~~ capillary; and

~~a calibrating unit configured to calibrate the flow-rate measuring unit;~~

wherein the flow-rate measuring unit includes

at least one temperature detecting unit configured to detect temperature of liquid inside the flow path ~~portion~~ capillary;

a heating unit configured to heat the liquid inside the flow path ~~portion~~ capillary;
and

a controlling unit configured to control heating temperature of the heating unit for heating the liquid inside the flow path ~~portion~~ capillary so that the temperature of liquid inside the liquid retaining portion and the temperature of the liquid inside the flow path ~~portion~~ capillary become substantially equal,

a flow path opening/closing unit configured to open and close at least one end of the flow path capillary to control the flow of the liquid into the flow path capillary; and

a calibrating unit configured to calibrate the flow-rate measuring unit under a closing operation of the flow path opening/closing unit.

26. (currently amended): The leak detector according to claim 24, wherein the calibrating unit calibrates the flow-rate measuring unit based on a signal corresponding to temperature of liquid being inside the flow path ~~portion~~capillary without flowing .

27. (previously presented): The leak detector according to claim 24, wherein the flow-path opening/closing unit includes a solenoid valve.

28. (currently amended): A leak detector for detecting leakage of liquid stored in a tank based on fluctuation in a level of the liquid, the tank including a top plate, a bottom plate, and a side plate connecting the top plate and the bottom plate, the leak detector comprising:

a liquid retaining portion including a space configured to retain liquid flown into the leak detector, the liquid flown being a part of the liquid in the tank;

~~a flow path portion through which the space communicates with an interior of the tank and through which the liquid flows in and out;~~

~~a flow path opening/closing unit configured to open and close at least one end of the flow path portion;~~

a flow-rate measuring unit provided near a bottom end of the leak detector, provided with a flow path capillary through which the liquid flows in and out and configured to measure an amount of the liquid flowing inside the flow path ~~portion~~ capillary;

a flow path opening/closing unit configured to open and close at least one end of the flow path capillary;

a calibrating unit configured to calibrate the flow-rate measuring unit under a closing operation of the flow path opening/closing unit;

a bottom attaching portion provided at the bottom end of the leak detector to detachably attach the bottom end to the bottom plate; and

a top assembly, attached to the top plate so as to cover an opening provided in the top plate and having a through opening through which an upper end of the leak detector is supported in such a manner that the upper end of the leak detector is simultaneously movable relatively to the top plate in a direction substantially perpendicular to a surface of the liquid while the bottom end of the leak detector is detachably attached to the bottom plate.

29. (previously presented): The leak detector according to claim 28, wherein the bottom end is detachably attached to the bottom plate with a magnet.

30. (previously presented): The leak detector according to claim 28, wherein the upper end is supported in the through opening using an elastic member.

31. (currently amended): The leak detector according to claim 28, wherein the flow-rate measuring unit includes;

at least one temperature detecting unit configured to detect temperature of liquid inside the flow path ~~portion~~ capillary;

a heating unit configured to heat the liquid inside the flow path ~~portion~~ capillary;
and

a controlling unit configured to control heating temperature of the heating unit for heating the liquid inside the flow path ~~portion-capillary~~ so that the temperature of liquid inside the liquid retaining ~~portion-capillary~~ and the temperature of the liquid inside the flow path portion become substantially equal.

32. (currently amended): The leak detector according to claim 28, wherein the calibrating unit calibrates the flow-rate measuring unit based on a signal corresponding to temperature of liquid being inside the flow path ~~portion-capillary~~ without flowing.

33. (previously presented): The leak detector according to claim 28, further comprising a protective member configured to protect the flow-rate measuring unit and the liquid retaining portion from the liquid, and arranged outside the flow -rate measuring unit and the liquid retaining portion, wherein

the protective member is formed with a metal having such a thermal expansion coefficient that a distance between the flow-rate measuring unit and the bottom plate is maintained substantially invariant.

34. (previously presented): The leak detector according to claim 33, wherein the protective member is formed with a material identical to a material of the tank.

35. (previously presented): The leak detector according to claim 28, wherein the flow-path opening/closing unit includes a solenoid valve.

36. and 37. (canceled).

38. (currently amended): A leak detecting system for detecting leakage of liquid stored in a tank based on fluctuation in a level of the liquid, the leak detecting system comprising:

a leak detector including

a liquid retaining portion including a space configured to retain liquid flown into the leak detector, the liquid flown being a part of the liquid in the tank;

~~—— a flow path portion through which the space communicates with an interior of the tank and through which the liquid flows in and out;~~

~~—— a flow path opening/closing unit configured to open and close at least one end of the flow path portion so as to control the flow of liquid into the flow path portion;~~

a flow-rate measuring unit including

a flow path capillary through which the space communicates with an interior of the tank and through which the liquid flows in and out, wherein the flow-rate measuring unit is configured to measure an amount of the liquid flowing inside the flow path portion capillary;

a flow path opening/closing unit configured to open and close at least one end of the flow path capillary so as to control the flow of the liquid into the flow path capillary;

wherein the flow path opening/closing unit is located ~~near the flow-rate measuring unit at the at~~
least one end of said flow path capillary; and

a calibrating unit configured to calibrate the flow-rate measuring unit under a
closing operation of the flow path opening/closing unit; and

a controller configured to control the leak detector.

39. (currently amended): A leak detecting system for detecting leakage of liquid stored in a tank based on fluctuation in a level of the liquid, the tank including a top plate, a bottom plate, and a side plate connecting the top plate and the bottom plate, the leak detecting system comprising:

a leak detector including

a liquid retaining portion including a space configured to retain liquid flown into the leak detector, the liquid flown being a part of the liquid in the tank;

~~—— a flow path portion through which the space communicates with an interior of the tank and through which the liquid flows in and out;~~

~~—— a flow path opening/closing unit configured to open and close at least one end of the flow path portion;~~

a flow-rate measuring unit provided near a bottom end of the leak detector,
provided with a flow path capillary through which the space communicates with an interior of
the tank and through which the liquid flows in and out and configured to measure an amount of the liquid flowing inside the flow path ~~portion~~ capillary; and

a flow path opening/closing unit configured to open and close at least one end of the flow path capillary; and

a calibrating unit configured to calibrate the flow-rate measuring unit under a closing operation of the flow path opening/closing unit; and

a controller configured to control the leak detector, wherein

the leak detector is arranged inside the tank in such a manner that a bottom end of the leak detector is detachably attached to the bottom plate ~~and while~~ an upper end of the leak detector is supported in a through opening provided in the top plate in such a manner that the upper end of the leak detector is simultaneously movable relatively to the top plate in a direction substantially perpendicular to a surface of the liquid while the bottom end of the leak detector is detachably attached to the bottom plate.